



Geometry and Physics of Duality

Workshop including the Hong Kong Geometry Colloquium (morning session)

Saturday, 29 November, 2014

Room 210, Run Run Shaw Building, HKU

10:00 – 11:00 **Peter Bouwknegt** (Australian National University, Canberra)

Spherical T-duality

Abstract: T-duality is an equivalence of String Theories on manifolds which are circle (or more generally, torus) bundles equipped with a background flux. Mathematically it provides an isomorphism for certain twisted cohomologies and K-theories for these manifolds. In this talk I will briefly review T-duality for circle bundles (U(1)-bundles), and then discuss a recent generalization to 3-sphere bundles (SU(2)-bundles), with applications to 7-twisted cohomologies and K-theories and the homotopy groups of 3-spheres. This talk is based on joint work with Jarah Evslin and Mathai Varghese [arXiv:1405.5844/1409.1296].

Coffee / Tea Break

11:30 – 12:30 **Varghese Mathai** (University of Adelaide, Adelaide)

Exotic twisted equivariant cohomology of loop spaces, twisted Bismut-Chern character and T-duality

Abstract: Fei Han and I define exotic twisted circle-equivariant cohomology for the loop space LZ of a smooth manifold Z via the invariant differential forms on LZ with coefficients in the (typically non-flat) holonomy line bundle of a gerbe, with differential an equivariantly flat superconnection. We introduce the twisted Bismut-Chern character form, a loop space refinement of the twisted Chern character form, which represent classes in the completed periodic exotic twisted circle-equivariant cohomology of LZ . We establish a localisation theorem for the completed periodic exotic twisted circle-equivariant cohomology for loop spaces and apply it to establish T-duality in a background flux in type II String Theory from a loop space perspective.

Lunch Break

14:30 – 15:30 **Jae-Suk Park** (Center for Geometry and Physics, POSTECH, Pohang)

When two quantum field theories are physically equivalent ?

Abstract: Quantum field theory often comes endowed with a physically natural duality, which leads to a duality or correspondence between different mathematical objects via some elaborate dictionary. Such correspondences are usually studied on a case-by-case basis, separately for each application. In this talk I will discuss an attempt to formulate quantum field theory based on certain algebraic homotopy category, such that the statement that two quantum field theories are physically equivalent has a mathematical definition.

Coffee / Tea Break

16:00 – 17:00 **Kwok Wai Chan** (The Chinese University of Hong Kong, Hong Kong)

SYZ mirror symmetry for toric Calabi-Yau varieties

Abstract: I will discuss mirror symmetry for toric Calabi-Yau manifolds/orbifolds from the viewpoint of the Strominger-Yau-Zaslow (SYZ) conjecture. As an application, we obtain a proof of a conjecture by Gross and Siebert which gives an enumerative meaning to (inverse) mirror maps in terms of virtual counting of holomorphic disks. This talk is based on a series of joint works with Cheol-Hyun Cho, Siu-Cheong Lau, Conan Leung and Hsian-Hua Tseng.

Organizer: Siye Wu